SUBSTITUTE SPECIFICATION

ELECTRONIC TRANSACTION SYSTEM USING A PORTABLE PERSONAL DEVICE

Field of the Invention

The present invention relates to electronic devices, and more particularly, to an electronic transaction system using personal portable transaction devices that load data and communicate information to a user based upon the loaded data.

Background of the Invention

At the present time there are various electronic transaction systems designed to manage payment of purchases of equipment goods or services, or to control authorization for access to different services. Typically, these systems are based on electronic cards, and particularly, smart cards assigned personally to the users initiating these electronic transactions. The card holder makes transactions either by inserting the card in a reader terminal in the electronic transaction network, or by placing the card close to a toll terminal or a remote access terminal designed for this purpose.

In the first case, the terminal comprises electrical connectors that set up a resistive contact with corresponding contact pins in a microcircuit on

the card to enable data exchanges related to the transaction. In the second case, the card comprises an antenna or an induction loop connected to the chip to make the link with the terminal. Transaction systems operating on this principle of remote data exchanges are often known as contact free passes. One example is a remote toll card for passing through toll booths without stopping.

Regardless of the means used to make the electronic transactions (with or without contact), the card or similar equipment cannot communicate useful information to the holder except for a brief message specific to the transaction being performed. For example, a conventional remote toll card comprises a light emitting diode and/or a beeper to indicate whether or not the toll operation took place correctly. This type of message is qualified in this description as a non-random message. This term denotes any message type that is pre-ordered according to the use of internal functions in the transaction device or transactions already carried out or being carried out.

In other words, the contents of these non-random messages may be predicted by prior knowledge of predetermined operating protocols, and possibly the history of the use of the personal transaction device. For example, non-random messages, in particular, include all commands and signals (for example, acknowledgment signals) exchanged between the fixed protocol for transactions and updated data originating from these transactions in a predictable manner. These transactions may include information about a remaining balance, statistics based on use of the device and any other information provided locally in the portable

device such as the time, date, standard welcome messages, and pre-programmed usage guides, etc.

Summary of the Invention

An object of the invention is to provide an electronic transaction system based on the use of a personal portable electronic transaction device, for example, a smart card, for enabling a user to receive various types of information through the card.

This and other objects, advantages and features are provided by an electronic transaction system between an installed network and personal portable transaction devices used to make electronic transactions through the installed network. In particular, the electronic transaction system comprises means of loading random information from the network into personal portable electronic transaction devices, such that this random information can be read from the personal portable electronic transaction devices.

For purposes of the invention, random information generally includes any type of information that is not in the category of non-random information as mentioned above. Therefore, random information is not predictable from internal operating rules of the transaction network or internal programs in the portable personal device. In particular, random information may be specific information or messages of various types originating from external the existing transaction system, and information added to it for resending to personal transaction devices that use the system.

For example, random information may include complementary information messages or messages related

to a service or an object obtained by the transaction. Thus, in an application in which the transaction system is used for the access right to a transport network, the random information may be composed of messages about the operating state of the network, information about directions or transfers to be used, promotion messages, information about services offered, etc. There is not necessarily any theme or relationship between the random information and the transactions, which may include general advertising messages, news, games, etc.

Advantageously, random information can be loaded to personal portable electronic transaction devices starting from at least one terminal used to perform transactions with these personal devices. In this way, random information can be loaded during a transaction.

Preferably, random information is loaded by a contact free exchange between the terminal and the personal portable electronic transaction device. In this case, the transaction and the random information transfer may be done using a contact free exchange. However, the invention may also be used for transaction terminal with contacts, such as conventional electronic card readers, for example.

A preferred embodiment of the invention includes voice reading means for random and/or non-random information collected or generated by the personal electronic transaction device. These means include conversion means integrated in the personal transaction device.

The voice reading means for information collected or generated by the personal electronic

transaction device form a man-machine interface, which is particularly attractive for electronic transactions. This makes it possible for the blind or almost blind to use electronic transaction devices, whereas conventional payment or electronic control systems are particularly difficult for these persons.

The voice function is also advantageous for persons who are normally obliged to put their glasses on or take them off to see information on a screen, or even for anyone who needs information (random or non-random) in badly lit locations. Furthermore, the voice function may be used to divulge information to persons with reading problems.

The voice reading means mentioned above are used to convert a flow of digital signals from any source, such as a memory or real time transmission, into an audio signal that is perceived by the person receiving the random message as being a message spoken through a loudspeaker or an earpiece.

To make the best use of the limited memory capacity of the personal electronic transaction device, at least some of the information that will be presented in voice form is compressed using data compression according to the MPEG 3 standard, for example, and the voice reading means is provided with data decompression means. This arrangement also shortens the transmission time, and therefore, reduces the necessary transmission range for the same quantity of information transmitted in non-compressed form.

In one preferred embodiment, the data compression only applies to the random information. In this case, the reading means may also comprise voice synthesis means intended to present non-random

information generated within the device or received from a terminal. Obviously, the information (random and/or non-random) may also be presented visually, for example, by means of a display screen with a scrolling display on the personal device or a separate welcome device.

The random information may be input and routed in various ways depending on the shape of the device. In one embodiment, the device comprises two separable parts composed of a card (such as a smart card) capable of doing electronic transactions independently, and a device into which the card fits for reading random and/or non-random information. Preferably, the card contains the means for reception of information read by the device into which the card fits, from the network. These means may include an antenna and a demodulator, for example.

In another embodiment, the personal transaction device is made in a single piece. In this configuration, it may advantageously be integrated in a device with a primary function unrelated to electronic transactions, such as a mobile telephone terminal, for example.

When the personal transaction device according to the invention is functionally integrated in a mobile telephone terminal, at least one of the following items in the telephone terminal (provided that they are available) is adapted so that it also enables embodiment of the personal transaction device: the reception and/or transmission interface by radio waves; data storage means; calculation means; audio output means; manual command or data input means; voice

synthesis means; the integrated smart card; and the electrical power supply.

Brief Description of the Drawings

Other advantages and characteristics of the invention will be clearer after reading the following description of embodiments given solely as examples with reference to the attached drawings in which:

Figure 1 is a simplified block diagram showing an example of random information being relayed via an automatic barrier according to the invention;

Figure 2 is a simplified block diagram of a personal electronic transaction device according to a first embodiment of the invention;

Figure 3 is a perspective view of the personal electronic transaction device illustrated in Figure 2; and

Figure 4 is a simplified block diagram of a personal electronic transaction device according to a second embodiment of the invention.

Detailed Description of the Preferred Embodiments

The example embodiments of this invention will be described in the context of a public transportation network, such as a subway, that uses a personal portable electronic transaction device as a means of payment for public transportation and as a transportation ticket when passing through control barriers. This same device may also be used as an electronic wallet in different shops. In this part of the description, it will be assumed that the personal transaction device is a smart card (denoted as a card below) identified as reference 2 in Figure 1.

The card 2 may be used in association with a device in which it can be fitted, such as a card case comprising elements capable of reading and/or management of data, which will be described in greater detail below. Figure 1 shows a control barrier 4 in the form of a turnstile. The barrier 4 comprises electronic equipment (not shown) designed for two separate functions: authorization to pass when a valid card 2 is presented in its checking area, and transmission of random messages to the card.

The first function is known in itself, and is used, for example, in toll booths as mentioned above. In the example, the control is made without contact. In other words, the validity state of the card 2 is verified by a two-directional remote data exchange through a radio wave or infrared link originating from a connection interface 6. The technical means necessary for this first function are well known to the expert in the subject, and therefore, will not be described further in this document for reasons of conciseness.

The second function is combined with the first function such that the card 2 can be downloaded through the same connection interface 6 with random information so that this information can be made available to its holder either in real time or afterwards. Thus, the barrier control 4 and downloading of random data may be done together as the card 2 is passed.

In accordance with the definition given in the introduction, the random information may include all information external to management of the transaction (in this case the conditional crossing of

the barrier 4), such as information concerning directions and transfers to be taken, for example, which may be determined based on a destination station read from the card, and the state of traffic. This information may include signaling of occasional technical problems, the time before the next train, the station at which it is recommended that passengers should get off for a special event or if a station is closed, promotions, advertising messages, etc.

Random information can be loaded intelligently, namely starting from data contained in the personal device or the programming of this device. The random information is initially received through the connection interface 6 originating from an information center 8 through a radio link (or a hardwired link) at a transmission frequency F1 that is not the same as the frequency F2 used for exchanging data with the card 2. The connection with the center 8 may be set up by relays and/or by cables. As a variation, the random information may be loaded by inserting memory modules in the control barrier equipment 4.

Figure 2 is a simplified block diagram of a personal electronic transaction device made from a smart card 2, and a device into which it fits, which may be in the form of a card case 10. The various functional elements are shared between the card 2 and the case 10.

In the example, the card 2 comprises a microcircuit in the form of a chip 12 provided with a set of contact pins 14 enabling input and output of data and power supply voltages to and from the chip 12 and the case 10, or a transaction terminal with

contacts. In this way, the card 2 can operate independently with a payment terminal or a terminal providing a conventional service. A multi-function card can also be used as an electronic wallet, a point's card, and an identification card, etc., in different electronic transaction networks. The chip 12 may also contain a memory area for the temporary storage of data before their transfer.

Card 2 also comprises contact free data exchange means based on a radio antenna 16 functionally connected to the chip 12. In particular, the antenna 16 receives random data transmitted in modulated form, for example, from the connection interface 6 (Figure 1). Consequently, the microcircuit 12 comprises a demodulator with an input connected to the antenna 16, and an output supplying binary data extracted from the modulated signal. The techniques for modulation (at the connection interface 6) and demodulation (at the microcircuit 12) enable bi-directional communication of digital data and are known in themselves, and will not be described here for reasons of conciseness.

The case 10 comprises a housing 18 in which the card 2 and a contactor assembly 20 fitted with contact pins 22 can be inserted. The contact pins 22 are laid out so that they are electronically connected to the corresponding pins 14 of the card 2 when the card is inserted. A battery 24, which may be rechargeable, is contained in the case 10 to power the entire set of functional elements, including the chip 12 when the card is housed in the case. For more clarity, all functional elements of the box 10 that makes up the case (and that will be described below) are shown diagrammatically outside this box.

The assembly is centered around a microprocessor 26 designed to execute a program stored in a memory 28. The memory 28 may be a read only memory (ROM). The microprocessor is capable of managing transactions (acknowledgment of orders, purchasing, reservations, total number of loyalty points, etc.) with a terminal. The microprocessor 26 also exchanges occasional data with a random access memory (RAM) 30. This data includes the state of the accounts and the history of accounts managed for the different services, and is also used for storage of data about random and non-random information.

Random and non-random information is sent to the user of the case 10 in voice form, through an audio decompression unit 32 and a voice synthesis unit 34 respectively. These units 32, 34 are controlled by the microprocessor 26 to format data from the RAM 30 so that it can be represented in useable form by an audio module 36. The audio module 36 comprises a digital-analog conversion stage and an amplification stage. The amplification stage is adjustable in volume by a potentiometer 38 accessible by the user. The audio module 36 controls outputs for a mini-loudspeaker 40 and an earpiece connector 42.

The case 10 also comprises a display device 44 connected to the microprocessor 26 to present random and/or non-random information to the user. The various functions offered by the device may be controlled using a manual control unit, in this case in the form of a keypad 46 associated with a logical interface. These functions include on/off commands, input of data related to a transaction (digital data), and the reading of random and/or non-random information.

An example of operation of the card 2 and the case 10 assembly will now be described. The configuration of the assembly enables the use of the card 2 alone (in other words, without the case 10), as a conventional smart card. In this situation, the card 2 alone can be connected to a contact terminal to make various purchases, credit charges, accounting and updating transactions, etc.

In this example, the card 2 may also be used alone to perform all types of transactions related to its use as payment mode, for accounting and as a ticket with respect to the transportation network. When the card 2 is placed in its case 10, the personal transaction device formed by the combination of the card and the case also enables loading and restitution of random information.

The random information routing sequence system will now be described. Initially, the information is generated at the information center 8, and is then distributed through the radio (or wire) link at a frequency F1 to the control barriers 4 and other terminals of the information system to be therein. When a personal transaction device 2, 10 is presented in the active area of the barrier 4, the connection interface 6 transmits all or a selected part of this random information to an antenna 16 of the card 2 on a signal modulated at a frequency F2.

This transmission may be done before, after or in time-sharing with respect to the non-random data exchange related to the transaction (which in this case is the counted authorization to pass). The range of the transmission at the frequency F2 from the connection interface 6 is sufficient such that the

personal transaction device 2, 10 can continue to receive information for a few minutes after passing, so that relatively long files can be loaded correctly. The modulated signal received by the antenna 16 during the transmission is processed by the demodulator in the microcircuit 12 to extract digital data about random information thus loaded.

In the example, the above-mentioned digital data are first compressed before they are transmitted through the connection interface 6. Compression is then done using the standard protocol known as MP3 or an equivalent protocol. This standard is particularly suitable for transmission of digital sound files, e.g., music and voice.

The compressed digital data thus received can be temporarily stored in a buffer memory area in the microcircuit 12 in the card 2 before being transferred to the different elements of the case 10. The data may also be transmitted directly towards elements of the case 10. In both cases, the compressed data are transmitted from the card 2 to the case 10 through contacts 12 and 24 which will then be loaded into the memory 30 under the control of microprocessor 26.

Random information is read either automatically, or under the control of the user by selection of a button on the manual control unit 46. In the latter case, the microprocessor 26 may be designed to transmit a sound signal indicating that information is loaded for the loudspeaker 40 or for the earpiece 42. This signal may be a pre-programmed spoken message produced using the voice synthesis unit 34 or a particular dial tone.

When the random information has been read, the corresponding data are unloaded from the RAM 30 and transmitted to the decompression unit using the MP3 standard. Decompression at this unit may be done by a program executed at least partially by the microprocessor 26.

Decompressed data are transmitted in the form of binary signals to the audio module 36, where they are transformed into a voice message. At the same time, the microprocessor 26 can control presentation on the display device 44 of the same message or complementary information, that can also be extracted from data received from the card 2.

When the personal electronic transaction device emits non-random information in the form of a voice message, such as an acknowledgment indication, an indication of the amount of the available credit or internally managed data such as the date and time, for example, the voice synthesis unit 34 processes data about this information. In this case, the data in question that may originate from the ROM 28, the RAM 30 or the card 2 are transmitted to the voice synthesis unit 34 under the control of the microprocessor 26.

In this case, the data are specifically formatted to reproduce their contents in voice form using techniques known in digital recording. Data output from the voice synthesis unit 34 are put into the same format as data output from the decompression unit 32, and in the protocol used for building up binary words. Consequently, these data are perceived transparently by the audio module 36 that transmits them in audible form to the loudspeaker 40 or the earpiece 42.

Figure 3 is a perspective view of the personal transaction device that includes the card 2 and its case 10. The case 10 is provided with a mini loudspeaker 40, manual controls in the form of a numeric keypad 46 and a display 44 on the same face. The volume adjustment potentiometer 38 and the earpiece connector 42 are located on one side of the case 10.

There is a slit 48 on one edge 10a of the case into which the card 2 fits such that the contacts 14 and 22 of the card and the connector 20 of the case are engaged in it when the card is entirely or partly placed in the case. As a variation, the personal transaction device can be made as a single piece. In this case, a box resembling the case 10 also permanently contains the functional elements of the card 2, and particularly its antenna 16. The microcircuit 12 forming the chip of the card may then be functionally integrated in the microprocessor 26.

Figure 4 shows a second embodiment of the invention in the form of a simplified block diagram, in which the personal transaction device is included in a mobile telephone terminal (handset). In this figure, elements with functions identical to or corresponding to those in Figures 2 or 3 have the same references and will not be described again, for reasons of conciseness.

A mobile telephone terminal conventionally comprises a keypad, a display, a microprocessor, a RAM and ROM, means of sending and receiving information by radio, and an audio output on an earpiece. This type of terminal also comprises a smart card programmed as a function of services allocated to the subscriber of the telephone network and is personalized by an access

code. All these elements may be adapted to functions like those described for a personal electronic transaction device also enabling the reception and broadcasting of random sound information.

Thus, in the scheme shown in Figure 4, existing elements of the mobile terminal identified in the form of blocks similar to those in Figure 2 are used so that they can also perform functions related to transactions with the possibility of processing random information. These elements are as follows.

The microprocessor 26, ROM 28 and RAM 30 assembly are programmed to operate the telephone, and the interface with the user is configured so that it can also perform the functions described with reference to Figure 2. The manual controls 46 are accessible through the telephone keypad, and are operated by a specific button or by inputting a code. The display 44, which may selectively display information related to the telephone, transactions or random information;

The audio module 36 with the volume control 38 selectively transmits the audio channel of the telephone system or voice synthesis units 34 or data decompression units 32 to the earpiece or to the loudspeaker 42. Both random and non-random information may be respectively transmitted. The smart card 2 is included in the terminal that also comprises the modules necessary for operation of the personal transaction device, either by integrating them on the same chip or by providing several chips respectively with appropriate reading means.

The radio interface 60 comprises reception means for radio telephone communication starting from an antenna 62, and demodulation means that may be

adapted to integrate functions of the demodulator integrated in the chip 12. The battery 24 powers the elements necessary for the telephone, and elements necessary for use of the personal electronic transaction device.

The personal electronic transaction device in the form of a mobile telephone handset as shown in Figure 4 is used in approximately the same way as the device in Figure 2. However, for practical reasons, all transactions will be made using contact free exchanges with the antenna 62. For example, when the user passes a control barrier 4 like that shown in Figure 1, the connection interface 6 will exchange the same information and will also load random information which may be listened to on the earpiece immediately or later when specifically requested.

Similarly, the handset may be used as an electronic wallet with contact free terminals enabling purchases or recharges. The frequencies used for contact free transactions may be the same as the frequencies used for mobile telephones, for example, 900 MHZ or 1800 MHZ, or they may be different depending on the radio interface 60. Obviously, the personal transaction device may be used in different forms (pager, clock, computer, etc.) while remaining within the framework of the invention as claimed.